

A RAND NOTE

**Getting U.S. Military Power to the Desert:
An Annotated Briefing**

David Kassing

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**Prepared for the
United States Air Force
United States Army
Office of the Secretary of Defense**

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PREFACE

In Operations Desert Shield/Desert Storm the United States deployed substantial military power, initially to deter Saddam from moving on Saudi Arabia, ultimately to drive his forces from Kuwait. The success of these deployments demonstrated capabilities that had only been advertised earlier. There is much to learn from analysis of the Gulf War deployments. But it is also prudent to recognize that potential future deployments may be different in important ways.

This briefing Note describes the ODS deployments both from the view of the units deployed and from the perspective of transportation capabilities. It reviews total performance and reports on several specific issues that arose in planning and executing ODS deployments. The goal of this analysis is to call attention to issues so that preparations for future deployments can be improved. It should be of interest to planners, policymakers, and operators of the strategic mobility system. Other ongoing RAND analyses examine future deployment requirements and systems in potential regional contingencies.

The presentation was originally prepared for the RAND conference on strategic mobility models held in January 1992. It draws on work conducted by RAND's Army Research Division (the Arroyo Center) and Project AIR FORCE Division and previously reported to the sponsors. The presentation was expanded, documented, reviewed, and published as part of the research-support activities of RAND's three federally funded research and development centers: Project AIR FORCE, sponsored by the United States Air Force; the Arroyo Center, sponsored by the United States Army; and the National Defense Research Institute (NDRI), sponsored by the Office of the Secretary of Defense and the Joint Staff. The work was overseen by RAND's Defense Planning and Analysis Department.

SUMMARY

The deployment of U.S. forces to the Arabian Peninsula in Operations Desert Shield/Desert Storm (ODS) focused attention on deployment capabilities. ODS deployments showed the wisdom of prior mobility planning, organization, and investments. The deployments also benefited from modern and spacious seaports and airports in Saudi Arabia. And, Iraq allowed the United States five months of unopposed deployments.

This Note describes the main dimensions of U.S. deployments to the Gulf area and reviews the performance of deployment systems. Some observations on needed improvements are included. The approach is largely descriptive. Where possible, performance is compared with expectations and plans. However, none of the available plans can be shown to have been feasible with the transportation available for ODS.

OVERVIEW OF DEPLOYMENTS

Initial U.S. deployments took about 90 days to deliver the forces General Schwarzkopf requested. The second phase of the deployments, beginning in November 1990, closed fewer combat forces but far more support and sustainment materiel.

Analysts have yet to develop a measure of "joint military power." Lacking that, the simplest metric is the size of the inputs to military power delivered: 500,000 personnel and more than four million tons of military supplies and equipment of every description. The record leaves no doubt that the resulting force (including coalition support) was sufficient to drive Iraq from Kuwait.

In spite of the substantial military power deployed in ODS, each of the Services retained substantial capabilities for other missions and contingencies. But, U.S. deployment forces—airlift and sealift—were almost fully committed to ODS.

DEPLOYING THE DEFENSIVE FORCE

Initial ODS deployments began swiftly following the President's decision to send U.S. forces to Saudi Arabia. The deployment system was mobilized in less than two and a half weeks. Force movements began promptly as well. Movements from CONUS installations to seaports for shiploading generally went smoothly. Local personnel found ways to work around any problems that developed.

Nonetheless, most Army units arrived in the theater later than General Schwarzkopf had requested. Air Force and Marine Corps units also closed later than requested. The reasons can be found in the capabilities of U.S. airlift and sealift systems.

For a variety of reasons, airlift performance was less than expected. Airlift encountered limitations on airfield capacity, both enroute and in the Gulf. Utilization rates for airlifters and their payloads were less than planned.

Prepositioning systems came close to expectations. However, two ships carrying Marine Corps combat equipment and supplies were not "on station" because of maintenance requirements. As a result, the units they carried were delayed in reaching the Gulf.

Sealift performance constrained the delivery of Army units. By mid-September deliveries were running about three weeks behind the schedule given in detailed deployment data. Though one Fast Sealift Ship (FSS) broke down, the performance of these ships was close to expectations. The Ready Reserve Force (RRF) ships - 96 vessels kept in inactive or "mothballed" status - did not meet expectations. Activations of these ships took twice as long as planned and many of the ships had to make long transits to pick up their first cargos. Still, RRF ships delivered more than one-third of the cargo sent in the initial deployments. Charters of commercial shipping, including 39 foreign flag ships, delivered another 27 percent.

DEPLOYING THE OFFENSIVE FORCE

Conditions were different for the deployment of the offensive force following the November 8th announcement of the President's decision. Deployment systems were up and running and a little more than half the cargo, Army forces from Europe, traveled a shorter distance. As a result, Phase II deliveries went faster than in August and September. Still, sealift deliveries lagged requirements and DoD had to scramble for shipping. Chartered ships - prominently foreign flag ships - delivered half the cargo. Following resolution of uncertainty about ammunition shipments, munitions deliveries surged in January.

DEPLOYMENT AND EXECUTION ISSUES

ODS deployment operations revealed many issues pertinent to future deployments. Six are summarized in this Note:

- (1) For the first month of the Phase I deployments, total transportation requirements were hard to pin down. Much of the uncertainty appears to be traceable to varying estimates of Army noncombat unit requirements. The uncertainty may have delayed some transportation decisions.
- (2) Initial air deployments were hampered by problems of coordination between users and the Military Airlift Command (MAC). At first, users could not supply cargo as fast as MAC delivered airlift. At the same time, deploying units complained about inadequate and mistaken notification from MAC. These problems were quickly resolved.

- (3) During Phase II, unit integrity was not preserved in sealift operations. This complicated reception and onward movement activities.
- (4) In Phase II, the coordination of passenger and equipment deliveries was abandoned to get personnel into the area before the January 15th deadline. Earlier the goal had been to deliver personnel in a 5- to 7-day "window" centered on the arrival of their equipment. Personnel from Europe arrived anywhere from one to three weeks before their equipment. At one point nearly 40,000 soldiers had to be housed in temporary camps. Providing for them taxed the growing support establishment in Saudi Arabia.
- (5) Resupply cargos in air channels came to exceed capacity. The resulting congestion slowed deliveries of vital parts and supplies. DoD created a unique express delivery service, "Desert Express," that handled only cargos deemed most vital.
- (6) Many prewar planning factors proved optimistic. As a result, some unrealistic expectations had been created.

OBSERVATION ON DEPLOYMENT PLANNING AND EXECUTION

Though ODS deployments were clearly successful, they also suggest important issues for DoD to consider in making planning and investment decisions. Observations from ODS deployments must be tested for their relevance in future contingencies. Some contingencies may require faster deployments through seaports and airfields that are under attack.

To prepare for this kind of challenge, DoD needs to address deployment as a systems problem and consider seven issues:

- How to provide more responsive planning?
- How to improve the coordination of deployment operations?
- Are improvements needed in CONUS?
- Whether to add to prepositioning?
- How to provide needed airlift?
- How to improve sealift capabilities?
- What theater reception capabilities to provide?

The answers to these questions should be reached through detailed and objective analyses of capabilities in future required contingencies and their costs. And those analyses must be tested by thorough review and public debate. Such analyses are ongoing in RAND and elsewhere in DoD.

ACKNOWLEDGMENTS

This briefing Note summarizes the work of many analysts both in RAND and in other DoD analysis centers. Where appropriate I have cited the contributions of others in the text and notes. My own work has benefited from research, review, and comment by many RAND colleagues. I am particularly indebted to Myron Hura, Ken Girardini, Fred Frostic, John Lund, Bruce Don, and Paul Steinberg for close and continuous support and advice.

The work underlying this presentation has also drawn data and insights from individuals and organizations throughout the broad strategic mobility community. Though here too there are far too many individuals to name, I owe special thanks to Colonel Ron Kelley (then at USTRANSCOM) and Mr. B. H. "Yogi" Bear of MTMC. My work also benefited from unstinting support from two outstanding Army officers in the Chief of Staff's office: Colonel Robert Killebrew (then with the CAIG) and Colonel William Crowder, DALO-TSM.

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1. INTRODUCTION

The deployment of U.S. forces to the Middle East in Operation Desert Shield and Operation Desert Storm (ODS) has focused attention on the deployability of U.S. military power. Though these operations represent only one point on the continuum of contingencies, considerable effort has gone into examination of deployment performance. This presentation summarizes the "facts" about the deployment of U.S. military power in ODS. It is both descriptive and selective.

No analysis can be purely and completely descriptive. The analyst must always select what to describe. For Desert Shield there is a massive amount of messages, situation reports, briefing charts, data bases, and special analyses to be sifted and summarized. That work requires a goal and a model. In the work supporting this presentation the goal was to help improve capabilities for future large-scale deployments of U.S. forces. The premise is that future deployments will conform to the general model of ODS, i.e., equipment will be shipped by sea and personnel will be flown into an operation area where they will marry up as fighting units under a joint commander.

Starting in August 1990, RAND mounted a substantial effort to bring analytical skills to bear on ODS issues. At least 15 researchers from Army and Air Force FFRDCs worked on deployment issues. Other RAND analysts worked on force readiness issues and logistics, medical, and combat planning problems. Thus, this briefing builds on a substantial base of RAND work. But when appropriate, this Note draws on the work of other organizations, notably the Army's Concepts Analyses Agency (CAA) and the Navy's Center for Naval Analyses (CNA).

The ODS experience tells much about current strategic mobility planning and execution capabilities. Some of the "lessons" can be used in shaping U.S. deployment capabilities for future contingencies. But first, they must be tested by analyses of a range of future contingencies. Though the exact conditions of ODS will never recur, examination of the deployments to Saudi Arabia suggests some ways to improve capabilities for some future contingencies. Both broad issues of total performance and some specific examples of "micro-level" analysis will be discussed.

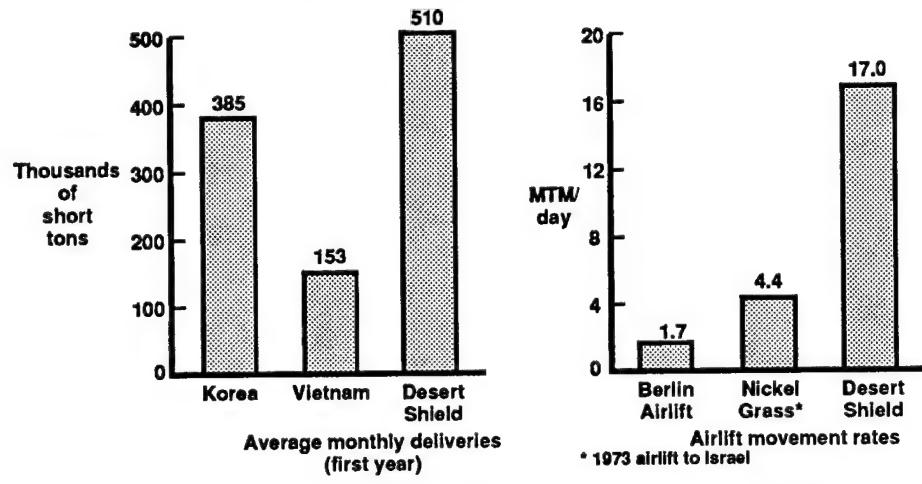
The next section of this briefing Note summarizes the development of the U.S. deployment posture and gives an overview of ODS deployment operations. This is followed by a short section on methodology. Sections 4 and 5 provide information on the deployments of the defensive forces (August 7th through mid-November) and the offensive force (mid-

November 1990 through February 1991), respectively. In Sec. 6 we present some examples of specific issues that arose as ODS deployments proceeded. Section 7 provides a series of observations on deployment planning and execution, including several questions that need to be addressed. The final section of the Note speculates about the direction the answers to these questions might take.

2. BACKGROUND AND DEPLOYMENT OVERVIEW

That a major contingency would erupt in the Gulf region did not take the United States completely by surprise. For more than a decade some military analysts had eyed the region's oil resources and considered how U.S. military power might be used to defend them. This section reviews preparations for contingencies in the Gulf and summarizes the performance of mobility forces during the seven months of Operations Desert Shield/Desert Storm.

The U.S. Demonstrated an Unprecedented Rapid Deployment Capability



Desert Shield required the largest U.S. deployments since Vietnam. But circumstances, strategies, and leadership were different and the pace of deployments to Saudi Arabia was more than three times greater than the rate achieved in 1965. The Korean War provides a better analog, one where rapid force closure was required to meet the threat. Even so, according to CNA estimates, the overall pace of movements in Desert Shield was one-third greater than accomplished during the first twelve months of the Korean War.¹ Data on airlift show even more striking changes in movement rates. MAC's performance was

¹See Ronald Rost, John Adams and John Nelson, *Sealift in Operation Desert Shield/Desert Storm: 7 August 1990 to 17 February 1991*, the Center for Naval Analyses, CRM 91-109, May 1991, pp. 1-2.

four times larger than in the 1973 airlift in support of Israel, known as Nickel Grass, and ten times larger than in the Berlin Airlift.²

²These and other airlift data come from the review of Desert Shield deployments conducted by RAND's Project AIR FORCE.

The U.S. Was Well Prepared for This Deployment

- CENTCOM had completed force planning
- Materiel was prepositioned near the Saudi Arabia
 - Ashore
 - At sea
- Airlift had been expanded in the 1980s
 - 50 C-5Bs
 - 59 KC-10s
- Sealift programs had also been improved
 - Fast Sealift Ships (SL-7s)
 - Ready Reserve Force

It is wise to recognize that the United States was well prepared for this deployment. In the late 1970s, following the troubling Nifty Nugget exercise, DoD began to improve the planning and coordination of large-scale deployments.³ The Joint Deployment Agency, created as one result of Nifty Nugget, became the core of the U.S. Transportation Command's (TRANSCOM) operational and planning staff when TRANSCOM was created in 1987. TRANSCOM was responsible for planning, coordinating, and conducting ODS deployments following the guidance and priorities of the U.S. Central Command (CENTCOM).

CENTCOM itself is a relatively new organization. In the wake of the Soviet invasion of Afghanistan and the hostage crisis in Iran, the Rapid Deployment Joint Task Force (RDJTF) was created. The RDJTF formed the basis for CENTCOM. And, in the first six months of 1990, CENTCOM had begun planning and gaming operations for defending Saudi Arabia.

Preparations were not limited to planning and organization. Across-the-board enhancements of deployment capabilities were funded and placed in service. The Air Force was able to preposition material ashore in some Mideast nations. The Marine Corps prepositioned unit equipment and supplies for three expeditionary brigades aboard ships.

³Nifty Nugget (1978) revealed deep and fundamental problems in large-scale joint deployments: unrealistic plans, inadequate communications, shortages of most materiel, insufficient transportation, too little manpower, and unworkable allocation procedures.

One of three squadrons was based at Diego Garcia in the Indian Ocean. The other Services also prepositioned supplies of several kinds (ammunition, food, medical, materiel-handling equipment) aboard ships in the Indian Ocean.

Airlift and sealift were also increased during the 1980s. MAC added 50 C-5Bs and the Strategic Air Command (SAC) acquired 59 KC-10s. The Navy procured eight SL-7s from SeaLand and converted them to carry roll-on/roll-off military cargo as well as containers. The converted SL-7s were kept in a partially manned status that allowed them to be activated in four days. The Ready Reserve Force of mothballed merchant ships was expanded significantly.

And There Were Many Other Favorable Circumstances

- Deployment operations were unopposed
- Saudi sea and airports were spacious
- Most fuel was available locally
- Worldwide support was broad
- Five months were available for deployment operation

Other circumstances eased our ability to deploy to Saudi Arabia. Of these, the most important is the fact that Iraq allowed the deployments to proceed unopposed. The U.S. deployment posture has been keyed to introducing personnel and equipment "administratively" into the theater, reassembling the combat units there, and moving to battle. Saddam allowed us the opportunity and time to do that.

Saudi Arabia possesses large and modern seaports and airports. These were not always fully available for deployment operations and were not fully satisfactory when used. Nonetheless, the facilities and services (including trucking) in Eastern Saudi Arabia were a clear plus for deployment operations.

The great bulk of the fuel needed was drawn from local Mideast sources. This meant that the United States did not have to activate tanker ships and find the mariners to man them, another favorable circumstance.

Moreover, worldwide support for the coalition against Saddam was strong. Though the deployments of coalition forces competed with U.S. operations for scarce resources, particularly sealift, their forces contributed directly to deterrent and offensive capabilities.⁴

⁴The British reported chartering over 100 ships for 132 voyages that delivered 432,000 short tons of equipment and supplies. The only account of the total sealift effort is by Robert O'Connor, "Sealift Shortfall During Gulf Crisis Sent U.K. Scrambling for Transport," *Armed Forces Journal International*, October 1991, pp. 38-40. There is a brief mention of the U.K. effort in the introduction to *Janes Fighting Ships, 1991-92*, p. 55

The U.S. shipping effort required and received a substantial capability from foreign flag ships. Third World countries also provided a little airlift.

Finally, the United States was able to carry out the deployments in two phases spread over more than six months. The arrival of personnel into Saudi peaked in December; the arrival of equipment peaked in January.

In Some Ways, Readiness Was Poor

- The planning process for 1990-91 had not been fully completed
- Experience and training on JOPES was limited
- Some doctrine was lacking
- Materiel condition of the RRF was poor
- It had never been done before

DoD had acquired most of the instruments needed for large-scale deployments, but their capabilities were not fully honed. Readiness for the specific crisis was, in some ways, less than expected.

Though CENTCOM had completed gaming an Iraqi attack on Kuwait and had a good idea of the forces it would need, the deliberate planning process for developing a "transportation feasible" deployment plan had not been completed. The development of Time Phased Force Deployment Data (TPFDD) to guide and coordinate deployment operations in detail was only just beginning. As a consequence, crisis planning had little to build on.

Moreover, experience and training on the Joint Operation Planning and Execution System (JOPES) was lacking in some of the units and installations that were expected to use it.⁵ And some important installations did not even have the equipment needed to use JOPES.

⁵JOPES uses computing and communications systems to provide command and control for planning and conducting conventional joint operations. The system is designed to contain records of both planned operations and actual performance and to connect all the DoD components engaged in a deployment (e.g., theater commanders like CENTCOM, all the Services, and other supporting commands such as USTRANSCOM and the Defense Logistics Agency). By accessing JOPES records, deploying units can see what is planned for them and get ready to move. Airlift and sealift operators can find the workloads implied by the plans and schedule lift operations to meet them. By comparing planned and actual deployment progress, senior decisionmakers can monitor, analyze, and control ongoing operations. For each of these purposes, JOPES must provide accurate and up-to-date information.

In ODS U.S. forces were deployed into a theater where there was no prior U.S. presence. For the most part, deployment doctrine had been predicated on moving into a "mature" theater where the United States had already established a substantial presence. The support establishment had to be built (and procured from host nations) as the operation proceeded.

And, as has been widely noted, the condition of the Ready Reserve Force ships was below that needed to meet activation goals.⁶

Finally, deployments of this size and speed had not been attempted before. Organizations and individuals had to work together and coordinate activities in ways seldom, if ever, tested.

⁶Of the RRF ships ordered activated for initial ODS deployment, 11 ships (24 percent) had readiness ratings of C-3 or lower as of 1 August 1990. Ships in C-3 status had "major deficiencies not repairable within the assigned readiness period." Ships in lower readiness categories would require even more work to make them seaworthy. So activation delays might have been anticipated.

The Result was Military Power in the Desert

- In the first 90 days, a substantial deterrent and defensive force was closed
 - 4-2/3s Army divisions
 - 18 USAF tactical fighter squadrons
 - A USMC expeditionary force
 - 65 USN combat ships
 - Supporting units and supplies
- In the next 75 days, the requested offensive force was delivered
 - 3-2/3s Army divisions
 - 9 USAF tactical fighter squadrons
 - A second USMC expeditionary force
 - 35 more Navy ships
 - Supporting units and supplies
- Mobility forces closed 500,000 personnel and 4.3 million tons of cargo

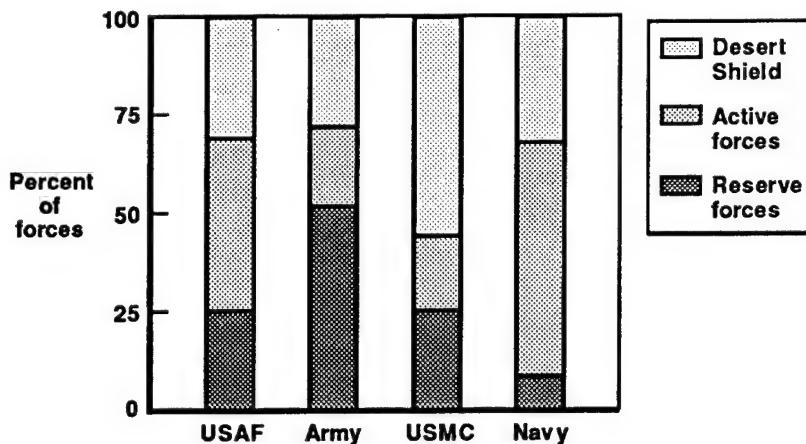
The net result was substantial U.S. military power deployed into Saudi Arabia and other Mideast locations. The initial deployments took about 90 days to close and support the forces CENTCOM requested to defend Saudi Arabia. The second phase of deployments closed fewer combat forces but far more support and sustainment materiel in about 75 days.

Analysts have yet to develop a metric for measuring joint "military power." Lacking that, the simplest metric is the measurement of inputs to military power: some 500,000 personnel and more than four million short tons of military supplies and equipment of every imaginable description.⁷ By another measure, airlift and sealift operations through March 1991 are estimated to have cost about \$4.5 billion.⁸

⁷To help put this and other data into perspective, a single Army armored division has about 16,000 personnel, weighs about 75,750 short tons, and occupies 1.3 million square feet of shipping area. But there is no single rule for converting between the weight and area of diverse Army combat and support units.

⁸This cost estimate is from Department of Defense, *Conduct of the Persian Gulf War, An Interim Report to Congress*, July 1991, p. C-5.

The Services Retained Substantial Capabilities



In spite of the substantial military power deployed in ODS, the United States retained significant military combat forces in CONUS, Europe, Korea, and at sea. In fact, the Air Force, the Army, and the Navy had deployed only about one-third of their general-purpose combat forces. The Marines put a little more than half their forces into ODS.⁹

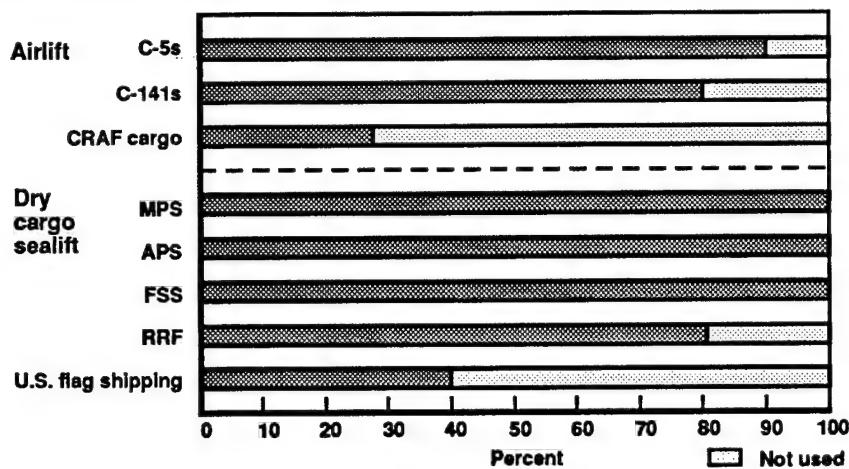
A note of caution: these fractions do not reflect the material condition and readiness of the forces left behind. The deployed forces were generally those in the best materiel condition and highest readiness. In fact, the nondeployed forces were "cannibalized" to provide supplies, equipment, and personnel for the deploying units. The proportion of ready U.S. combat forces deployed by the Army, Air Force, and Navy was clearly higher than one-third. Moreover, if we examined more specific components of military capabilities, trucking companies for example, we would find even higher proportions deployed to Saudi Arabia.

These are estimates for mid-January 1991. For the Air Force, the measure is tactical air squadrons; for the Army and Marines it is brigades, and for the Navy it is deployable battle force ships.¹⁰

⁹The vertical bars divide the forces of each service into three groups: "Desert Shield" is the proportion of the total (active and reserve) deployed in ODS, "Active forces" shows the proportion of total force that is on active service but not deployed in ODS, "Reserve forces" is the proportion of total forces in reserve and guard units and not deployed in ODS.

¹⁰The data for Air Force, Army, and Marine Corps capabilities were developed by the Rand Project AIR FORCE Desert Shield Assessment Team.

But U.S. Cargo Lift Was Largely Employed



In contrast, U.S. cargo lift capabilities were almost fully committed to ODS deployment and sustainment operations. At the peak, 90 percent of the C-5s and 80 percent of the C-141s were committed to deployment or channel operations in support of ODS.¹¹ But only 30 percent of the cargo capacity in the Civil Reserve Air Fleet was put into service.¹²

Turning to sealift, the picture is similar. All of DoD dry cargo prepositioning ships were used: 13 Maritime Prepositioning Ships (MPS) carrying equipment and supplies for the Marine Corps and eight Afloat Prepositioning Ships (APS) carrying supplies for the other Services. All eight of the SL-7 fast sealift ships (FSS) were also used. Eventually, about 80 percent of the dry cargo ships in the Ready Reserve Force (RRF) were mobilized. Considering both charters and ships engaged in the SMESA (Special Mid-East Shipping Agreement) containerized resupply operations, the estimate is that about 40 percent of U.S. flag shipping was employed to support ODS.¹³

¹¹These estimates are drawn from the USAF White Paper "Air Force Performance in Desert Storm," April 1991. The high priority given to ODS airlift missions meant that most other missions (e.g., training, exercises, and routine missions for all other theater CINCs) had to be cancelled or curtailed.

¹²This estimate is based on MAC's Monthly Civil Reserve Air Fleet (CRAF) Capability Summary for 1 July 1990, published by Mary Chenoweth, *The Civil Reserve Air Fleet: An Example of the Use of Commercial Assets to Expand Military Capabilities During Contingencies*, N-2838-AF, RAND, June 1990, p. 38.

¹³In 1990 operating U.S. flag dry cargo merchant ships numbered about 150. Of these, 28 were employed by the charter and 30 were used in SMESA operations at some time during ODS.

The contrast with the preceding chart is clear. DoD had substantial conventional combat forces for other contingencies but lacked the capability to deploy them if that should be needed.

3. HOW WE ANALYZED ODS DEPLOYMENTS

This section briefly describes the approach to the RAND analysis presented in the following sections. Though the work presented is largely descriptive, an account of the general logic of the research puts the facts and empirical data into an analytical context. For the most part, only the simplest statistical calculations and comparisons were used.

Analysis of Initial Deployments Is Most Telling

- **Short warning and other uncertainties will characterize future deployments**
- **Plans will not fit exactly**
- **Systems and personnel will have to be mobilized**
- **Missions and priorities will change**

From the start, our analysis of Desert Shield deployments took as its goal to learn from ODS to improve future operations. We were not simply interested in recording the facts for history or advertising U.S. deployment capabilities. And, if we want to understand U.S. capabilities to "get out of the blocks" in rapidly unfolding future contingencies, the experience of the initial deployments is the most appropriate.

The reasons for this are clear. Given the great uncertainty about future regional contingencies, initial ODS deployments are a better model than the subsequent deployments of an offensive military capability. Although the United States had a week or two of ambiguous signals about Saddam's intentions, no significant actions were taken before Iraq invaded Kuwait and only a handful were begun before the August 6th presidential decision to respond with force.

As in ODS, future contingencies are likely to be marked by ambiguous signals, plans that do not fit, systems and manpower that have to be mobilized, and priorities that change frequently.

But there may well be some important differences as well. Theater facilities and local services may be considerably poorer than Saudi Arabia's.

Potential opponents are also learning from ODS. Although some may be deterred by the U.S. capabilities so clearly demonstrated, others may have learned the importance of opposing U.S. deployments. Some future deployments may be under attack from the start. Planning for the crucial early days of such operations must go beyond implementing ODS lessons and explicitly address such eventualities.

Performance Should Be Compared with Plans and Expectations

- By themselves, statistics tell little
- A standard of comparison is necessary
- But a "transportation feasible" TPFDD was not available to use as a standard
- However, other standards can be used
 - CENTCOM requested buildup
 - TPFDDs when available
 - Pre-ODS planning factors

One can find lots of statistics describing the amount of cargo and numbers of passengers moved during ODS; a few were cited above. But, by themselves, these statistics tell little. It has been said that the United States moved the equivalent of Oklahoma City to the Middle East. That's great. But, if we had needed to move Chicago and delivered only Oklahoma City, the conclusion would be different. So, some standard of comparison is needed.

Since, the deliberate planning system had not had time to produce a fully wrung out "transportation feasible" TPFDD for ODS deployments, other standards have to be used. We employ three. The first is the closure dates requested by CENTCOM during the first few days of the operation. The second is TPFDDs for Army units provided to us by Army staff. Lacking either of those standards, we referred to earlier studies and analyses done in the mobility community (such as the *Revised Intertheater Mobility Study* published in 1989) for accepted quantitative measures of expected deployment system performance. And, for some operations we were unable to come up with appropriate standards.

The Quantity and Quality of Data Varied Widely

- **Copious data on aircraft and sealift performance**
- **Incomplete data for matching cargo to lift**
- **Limited data on movements in CONUS**
- **Few data on initial phase reception and onward movement**
- **No data on EAD unit closures**

There are many data available about ODS deployment and logistics operations.

There are operating tools such as MTMC's Deployment Status Reports and MSC's Statistical Summaries. There are data bases accumulated in most of the major commands. There are daily SITREPS from literally dozens of commands involved in making ODS deployments and supporting them. There are staff files in countless organizations. And there are "After Action Reports" by participating organizations and units. All this provides grist for analytical mills.

In time, many issues and concerns will get resolved or will fall from view and new and better data may emerge. At present, the data available to RAND, and, I suspect, to others, vary greatly in quantity and quality. We have excellent data on ship and aircraft operations but only rough data for matching cargo to aircraft. Data on movements within CONUS (and Europe) are sketchy. For understandable reasons, data on the earliest operations in August and September are often lacking; we have essentially no data on reception and onward movement in Saudi Arabia until late November. In some areas, we have no usable data: closures of Echelon Above Division (EAD) units and coalition force deployments, to give but two examples.

4. ANALYSIS OF PHASE I: DEPLOYING THE DEFENSIVE FORCES

For reasons already discussed, the Phase I deployments (August 7 through mid-November) are the main focus of this briefing Note. For economy of presentation, a few of the following charts present data covering both phases of ODS force deployment and sustainment activities.

Chronology of Deployment Decisions

Presidential Decision		Deployment System Actions
Aug 6	Authorize defensive force deployments (Phase I)	<p>Aug 7 – First deployment order FSS activated MPS and APs ordered to sail</p> <p>Aug 8 – MTMC activates CORE program</p> <p>Aug 10 – Ship chartering begins First RFF activation orders</p> <p>Aug 17 – CRAF (Stage I) activated</p> <p>Aug 20 – Air resupply channel established</p> <p>Aug 22 – Reserve activations authorized</p> <p>Aug 23 – SMESA established</p> <p>Oct 30 – Desert Express service started</p>
Nov 7	Authorize offensive force deployments (Phase II)	<p>Dec 4 – Added RRF ship activations</p> <p>Jan 17 – CRAF (Stage II) activated</p>

There are many chronologies of ODS events, decisions, and milestones.¹⁹ This one focuses on top-level decisions affecting deployment capabilities. Deployment operations were impelled by two presidential decisions—the first taken on August 6th, the second announced on November 8th. It is clear that most of the main decisions affecting Phase I deployment capabilities were made within two and a half weeks of the August decision. In short, the system mobilized rapidly. That does not imply that all requirements were foreseen by mid-

¹⁹ The *Military Review* of September 1991 contains a lengthy chronology (pp. 65-78). There is a chronology, emphasizing naval and amphibious operations, in U.S. Navy, Office of the Chief of Naval Operations, *The United States Navy in "Desert Shield" "Desert Storm,"* 15 May 1991, pp. A-1 to A-61. The Association of the United States Army's Special Report, *The U.S. Army in Operation Desert Storm*, June 1991, presents a chronology on p. 2. A fourth listing, "A Chronology of Events," appears as part of the Desert Storm Almanac in *Military Technology*, Issue 6, June 1991, beginning on p. 117.

August; they were not. But it does mean that the needed organizations and personnel went to work quickly.

The need for and conception of the "Desert Express" service came later in Phase I, after experience with the use of airlift channels highlighted the need for a rapid response resupply capability.

The experience of Phase II is clearly different. Though three RRF ships were activated in mid-November, it was not until December 4th that a significant number of additional ship activations (14) were ordered. Requirements for munitions shipments were not clarified until early December; they implied that additional breakbulk ships from the RRF were needed. The second stage of CRAF was not called until mid-January when the air war began. Then the need was for cargo aircraft to carry sustainment materiel.²⁰

²⁰See the testimony of General Hansford Johnson, Commander-in-Chief, U.S. Transportation Command (February 26, 1991), U.S. Congress, House of Representatives, Subcommittee on the Department of Defense of the Committee on Appropriations, *Hearings on Department of Defense Appropriations for 1992*, 102nd Congress, First Session, p. 7.

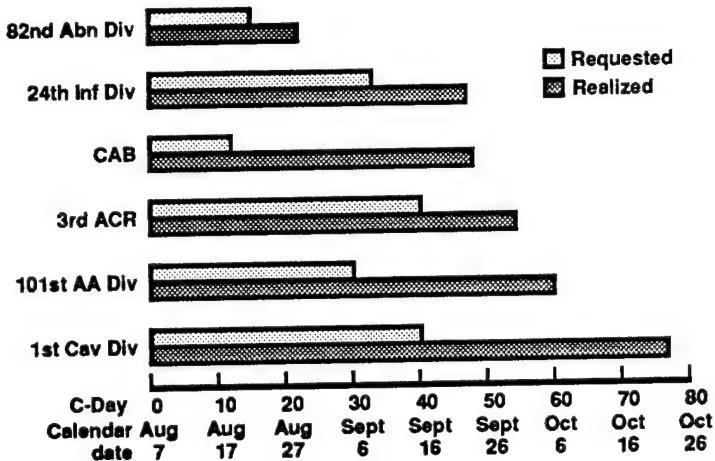
Fort-to-Port Movements Went Well

- Road and rail movements in CONUS were generally smooth
- Units and installations met and overcame problems such as
 - Limited rail loading capacity
 - Rail delays enroute
- Such problems had little impact on total movements
- Unit equipment reached seaports ahead of or simultaneously with shipping
- Only 9 percent of in-port delays were attributed to cargo

Systematic data on fort-to-port movements are scant. By most accounts, these operations were conducted without hamstringing deployments. In this area, as in many others, local personnel found ways to work around emerging problems. The sorts of problems met and overcome included shortages of rail cars, limited rail loading capacities, and delays in rail yards enroute. But, insofar as we can tell, such problems had no significant effect on total movements and force closures.

MTMC Eastern Area data show that (at least during most of Phase II) cargo was generally available for loading in East Coast and Gulf Coast seaports. For both phases, MTMC has identified the sources of delays occurring in seaports. Delays can be attributed to port problems (for example, lack of stevedore gangs), ship problems (for example, time to weld in pad-eyes), weather, and lack of cargo. Only 9 percent of all in-port delays were attributed to cargo problems. A comparison of Army unit logs with reports of sealift activities confirms that unit cargo availability for loading was not generally a source of delay in deployments. Reports from MTMC's Transportation Terminal Units also show that cargo on-hand regularly exceeded the amount of shipping available to load.

Closures of Army Combat Units Were Later Than CENTCOM Requested



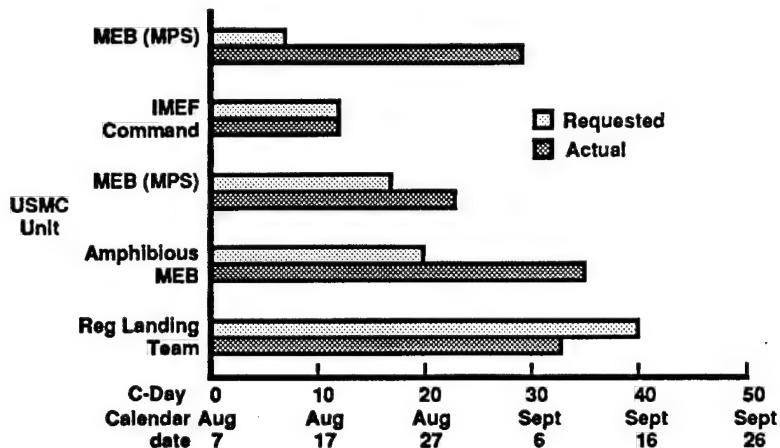
Ground combat units closed their forces in Saudi Arabia over a period of time, in some cases as long as a month. This makes the identification of unit closure difficult or arbitrary. Clearly, significant military power can be in place even though a few items of equipment are not in the theater.

This figure contrasts the closures requested by CENTCOM with the "actual" closures as reported by the Army's Concepts Analysis Agency.²¹ In all cases closure is later than CENTCOM asked.²² And, with the exception of the Combat Aviation Brigade (CAB), the differences between requested and actual closures increase as time passes. It may well be that the long delay in the closure of the CAB is due to a sourcing problem rather than to delays within the movement system. But the long delays in closing the 101st Air Assault Division and the 1st Cavalry Division can be attributed to the transportation system.

²¹Since CENTCOM'S staff had neither the time nor the sophisticated tools to make detailed estimates of transportation capabilities, there can be no assertion that his goals could be met under the best of circumstances. Nonetheless, they give an unvarnished view of the directions from the responsible field commander. The CAA closure estimates are from *Strategic Deployment Review Study (STRADER)*, a briefing presented by Captain Elizabeth Vance at the Military Operations Research Society Mini-Symposium on "Analysis Lessons Learned—Operations Desert Shield/Desert Storm," December 10, 1991.

²²The C-day scale on the figure measures the number of days after the first movement begins. For ODS, C-day was August 7th, so C+10 was August 17th, C+20 was August 27th, and so on.

Major Marine Corps Units Were Later Than Requested



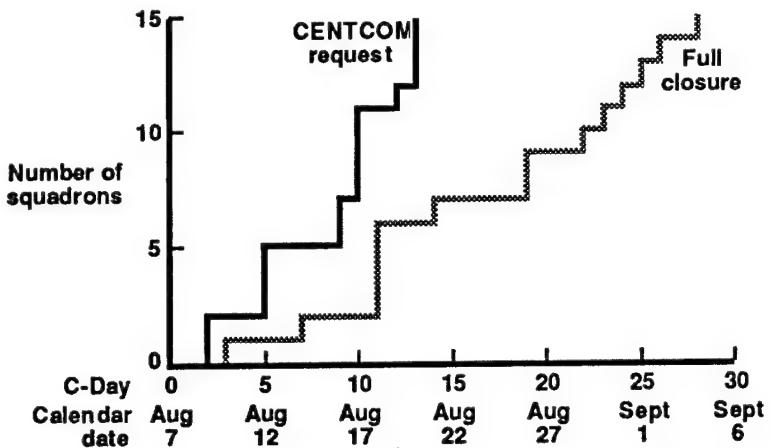
The approach used for comparing desired Army unit closures with actual deployment performance can be applied to major Marine Corps units as well. By August 8th, CENTCOM had identified closure dates for five Marine Corps units. The reason for the late closure of the two MPS Marine Expeditionary Brigades (MEBs) will be examined below. The closure of the I Marine Expeditionary Force (IMEF) Command is harder to pin down. The Commander, Lieutenant General Boomer, arrived on the required date. But IMEF did not assume command until two weeks later and the command was not "stood up" until September 5th (C+29).²³

The amphibious MEB sailed from CONUS East Coast ports and closed several days later than CENTCOM had requested. But the Regimental Landing Team, deploying from the Western Pacific, arrived in the Gulf region a week ahead of the originally requested date.²⁴

²³This account is based on an article by Brigadier General Edwin Simmons, USMC (retired), "Getting Marines to the Gulf," in the *U.S. Naval Institute Proceedings*, May 1991, p. 55. The chart assumes that the presence of the Commander is sufficient for closure of the IMEF Command.

²⁴The movements of the amphibious forces have been reconstructed from data contained in the U.S. Navy chronology cited above.

Tactical Fighter Squadrons Were Also Later Than CENTCOM Requested



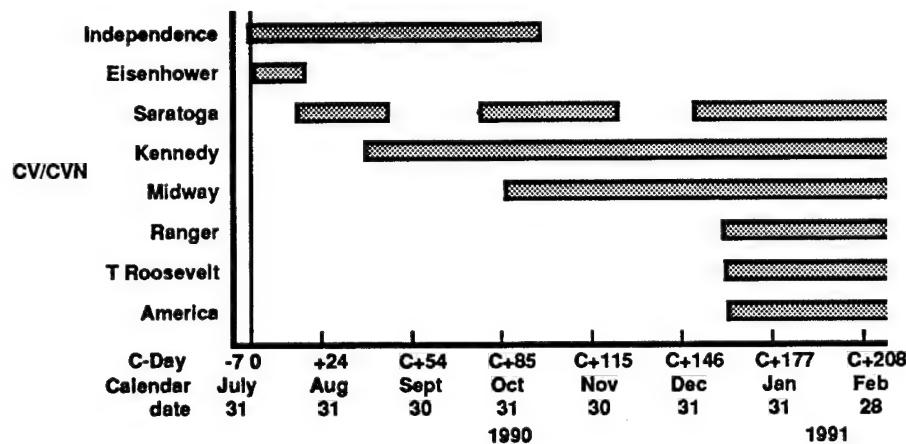
Here is the same comparison for the first 15 deploying tactical aircraft squadrons: four F-15 squadrons, five F-16 squadrons, four A-10 squadrons, one F-117 squadron, and one F-4G squadron.

Though in some cases parts of the squadron arrived in the Mideast before the requested date, full closure of the units and their organic support lagged the request by about two weeks.²⁵ Note that the lag increased in mid-August when large airlifts of Army and Marine Corps personnel competed for the use of limited airlift.²⁶

²⁵SAC tanker airlift provided substantial support to deployment operations, refueling over 1,000 fighters and bombers, some as often as seven times. KC-10 and KC-135 aircraft made about 6,000 sorties in support of airlift during Desert Shield. This was about one-third of their total Desert Shield effort.

²⁶The reservation noted above—the goals may not have been feasible—applies here as well. The requested tactical air closures may have been impossible to achieve.

Six Carriers Were Deployed for the Air War



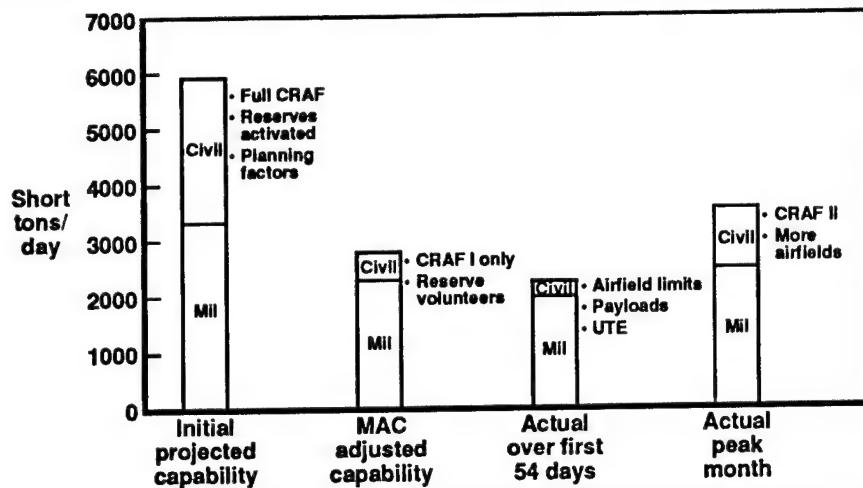
Naval forces generally self-deploy. Records of their movement do not appear in DoD transportation reports. Moreover, their deployment areas are more flexible and they can be "on station" while operating at distances from the main ground theater. The Saratoga, for example, twice moved away from and returned to the defined contingency area of operations.

For this conflict, the best single measure for naval forces is the number of carrier forces deployed. The chart shows U.S. Navy deployments of aircraft carriers through Operations Desert Shield and Desert Storm.²⁷ Initially, two carriers were on station. The deployed force was increased to three carriers for a period in October and November. Then, in mid-January, in anticipation of the air war, six carriers were deployed for Desert Storm operations. They remained on station until the end of the war.

Another 94 Navy ships were "in the theater" in mid-January. These included surface combatant ships escorting carriers and performing maritime intercept (embargo-enforcement) operations, amphibious shipping carrying Marines ready for assault operations, combat logistics support ships, and minesweeping forces.

²⁷The Department of the Navy chronology is the source of the data on carrier deployments.

Airlift Performance Was Less Than Projected



Over the full span of ODS, airlift performance did not reach the levels projected in the most optimistic estimates. For example, assuming full activation of all reserve airlift plus all of CRAF and using pre-ODS planning factors yield an estimate that airlift would deliver about 6,000 short tons of cargo a day. An early MAC estimate, allowing for only the first stage of CRAF and reserve volunteers, indicated that about 2,800 tons per day might be delivered.

In fact, airlift delivered an average of 2,300 tons per day during the first 54 days of the Phase I deployments. The lower performance reflects limitations on the use of airfields in the theater, less than expected payloads, lower than planned utilization rates for airlifters, and degradations in other airlift planning factors.

By Phase II some of the problems had been overcome. Peak airlift performance was in January when the second stage of CRAF had been activated. Airlift then delivered about 3,500 short tons per day.

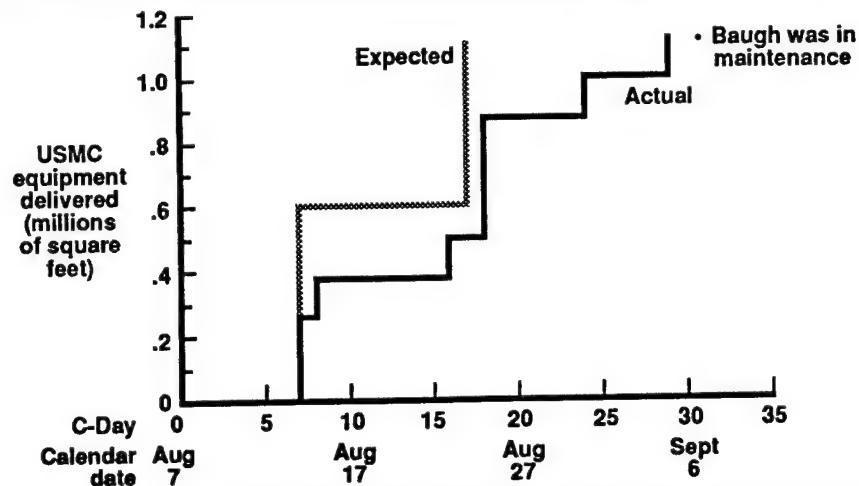
Afloat Prepositioning Ships Worked According to Plan

- Eight dry cargo ships were loaded with supplies and equipment
 - Munitions
 - Rations
 - Medical
 - Cargo-handling equipment
- All eight were ordered to sail on August 7th
- All arrived at Mideast destinations without incident
 - Seven ships on August 17th
 - One ship on August 18th
- Some ships were used as floating warehouses

The Afloat Prepositioning Force was established in the early 1980s to carry some supplies (including fuels) for the Army, Navy, and Air Force. In early August, seven of the eight dry cargo ships were operating in the Indian Ocean, the eighth was in the Mediterranean.

These ships were ordered to sail on August 7th and all reached their destinations within 11 days. Some of the ships were, for a time, used as floating warehouses. The materiel offloaded was generally found to be in usable condition.

Most Prepositioned USMC Combat Equipment Arrived Close to Expectation



In the early 1980s the Navy Department created Maritime Prepositioning Ship (MPS) squadrons carrying Marine Corps combat unit equipment and sustaining supplies. Two of the three squadrons (the ones from Diego Garcia and Guam) were ordered to sail on August 7th.²⁸ By planning factors, the Diego Garcia squadron could be expected to reach Saudi ports and begin unloading in seven days, the Guam squadron would arrive about ten days later.

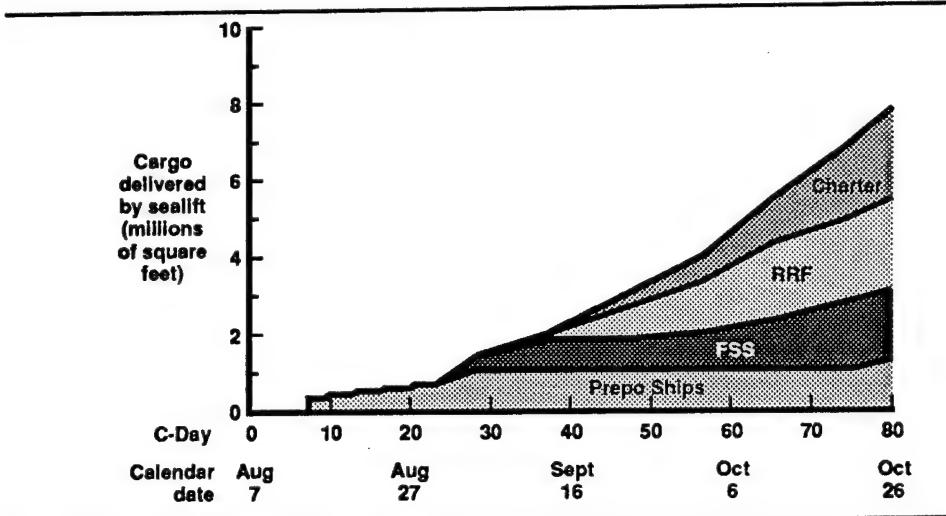
About three-quarters of the MPS ships had reached SPODs (Sea Ports of Debarkation) in Saudi Arabia by C+18.²⁹ But neither squadron had fully closed at that time. Both squadrons had one ship "offline" in the maintenance cycle in early August. The last MPS ship to close—the Baugh—was in maintenance on the East Coast of the United States. It took this ship just 29 days to "button up," reload its cargo, and make the long transit to Saudi Arabia.

²⁸According to one report, there had been discussions within DoD as early as the end of July about moving the MPS ships toward the Gulf. Bob Woodward reports that the idea was rejected by General Powell. See Bob Woodward, *The Commanders*, Simon and Schuster, New York, 1991, pp. 215-216.

²⁹Different scales are used to measure sealift effort for different kinds of cargo. In this and several subsequent charts, shipments of unit equipment are measured by deck area the cargo occupies, i.e., in square feet. Deck space occupied is the appropriate measure for unit cargo. For munitions and other sustainment cargo, the metrics are different. For measuring such cargos the weight of the cargo (short tons) or its volume (measurement tons) is used to identify and report shipments.

Such recognized and predictable maintenance factors are sometimes omitted from mobility planning and capability studies. They should be routinely included in assessments of deployment capabilities.

Components of Sealift Contributed Sequentially



It is useful to think of DoD as having access to several "tiers" of sealift shipping that differ in the speed of their first deliveries. The prepositioning ship programs just described are the most ready. They are fully manned, loaded with cargo, and operate near or in areas of likely contingencies.

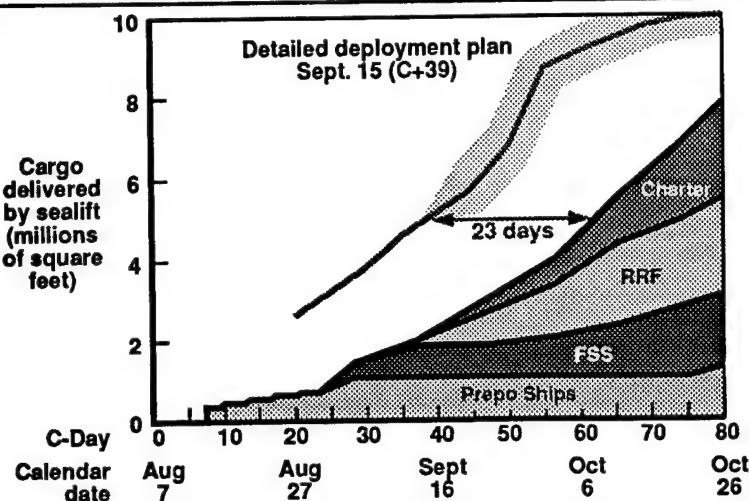
Fast Sealift Ships (FSS)—these are the converted SL-7s—provide a second tier of strategic sealift readiness. These ships are partially manned and expected to be ready to load in four days. They are generally positioned near the ports where they will load.

The Ready Reserve Force (RRF) is the third tier. It contains several types of ships. RRF ships are unmanned and kept in "mothballs" at three locations around the United States. Before ODS, planning factors indicated that most of these ships would be available in five days, though some were in ten-day status and others in 20-day readiness.

DoD also can charter privately owned ships operating in the world shipping markets. These ships—U.S. and foreign flag—provide the fourth tier of sealift. Though the ships are fully manned, they are scattered over the globe in commercial activities. Some are in U.S. ports and available quickly. Others, in distant waters, must deliver their commercial cargos and return to SPOEs (Sea Ports of Embarkation) to load military cargo.

ODS revealed these tiers in operation. Prepositioning ships made the first deliveries, followed by the FSS. Then RRF and chartered ships began to add to the total cargo delivered. In the first 80 days sealift delivered about eight million square feet of cargo, providing a significant military capability.

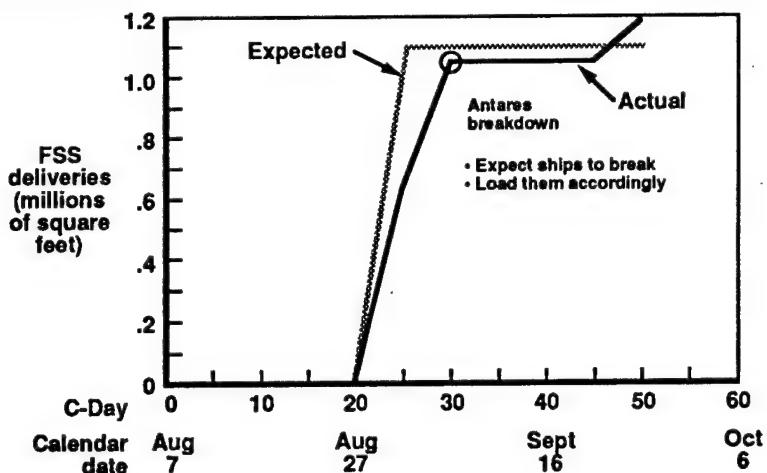
Actual Sealift Performance Lagged Behind Plan



But the total deliveries were noticeably less than the plans indicated. Here we have added aggregate requirements from the Army portion of the TPFDD for mid-September. Deliveries were 23 days behind the plan at that time. Put another way, 40 days into the deployment CENTCOM had received less than half the Army cargo the TPFDD called for. At about this time General Schwarzkopf told reporters that the deployment was running behind schedule because of sealift problems, though he thought it was only a week behind.³⁰ The general indicated that in two more months (i.e., by the middle of November) he would be able to defend Saudi Arabia against "any attack they the Iraqis could possibly have."

³⁰See Molly Moore, "Buildup in Gulf Reported to Lag, Commander Says He Needs 2 Months," *The Washington Post*, September 13, 1990, p. 1.

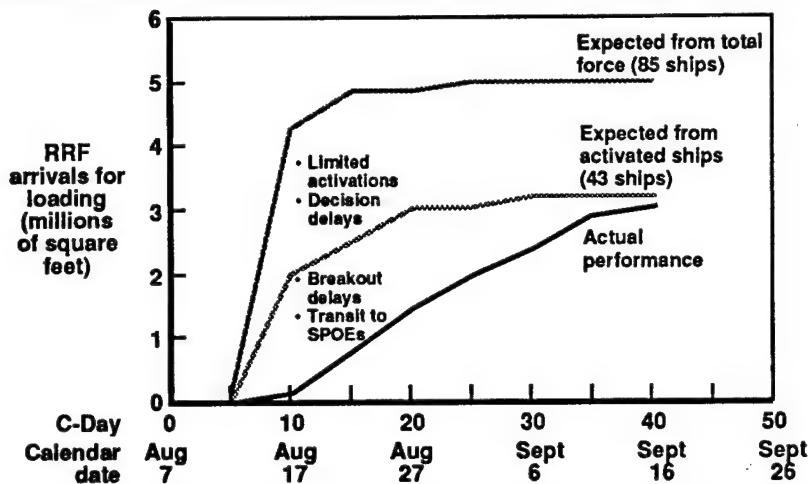
FSS Came Close to Expected



The performance of the Fast Sealift Ships came close to that suggested by planning factors. The eight FSS were activated and loaded quickly and made good speeds on their first transits. But, one of the eight, the Antares, had been employed though it was known to need repairs. Antares broke down and was towed to Spain where her cargo was transferred to an FSS that had already delivered its first cargo.

Planners, ship loaders, and deploying units should learn from this experience. It can be expected that some ships will suffer mechanical failures; assessments should allow for such events. If rapid force closures are demanded, additional ships are needed to offset maintenance activities. That being the case, the need to "spread load" capabilities across several ships, rather than placing all of one type of equipment or supply on a single ship, is apparent.

RRF Did Not Perform According to Expectation

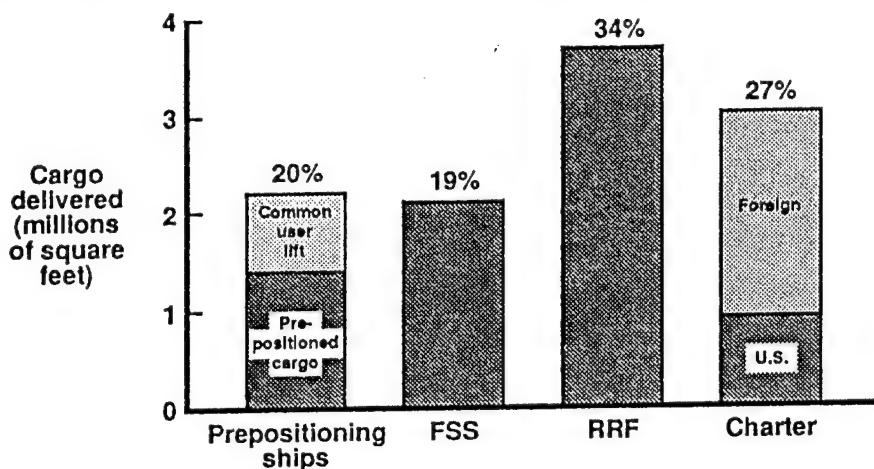


The RRF did not meet the expectations created in mobility planning and studies.

Though all of the more productive roll-on/roll-off ships were ordered activated on August 10th, many of the less capable breakbulk ships were not called to service. In Phase I, only 43 of the 85 RRF dry cargo ships were activated. And, the activation requests were spread out over August rather than made at the outset of the contingency. Still, had they been made ready according to the 5-, 10-, and 20-day readiness planned, RRF ships would have arrived at ports to load cargo as indicated by the middle line of the chart. Actual performance was notably slower, for two reasons. Ship activations, on average, took twice as long as planned.³¹ And, some of the ships had to make long transits from their activation sites to their assigned SPOEs.

³¹Only about 25 percent of the RRF ships completed activation within the planned time. More than half the ships experienced delays of one to ten days. The remaining ships were delayed at least ten days, but one was never made operational during Phase I. Delays in activation were correlated with poor material conditions in the RRF fleet.

Charters of Foreign Ships Significantly Augmented U.S. Shipping

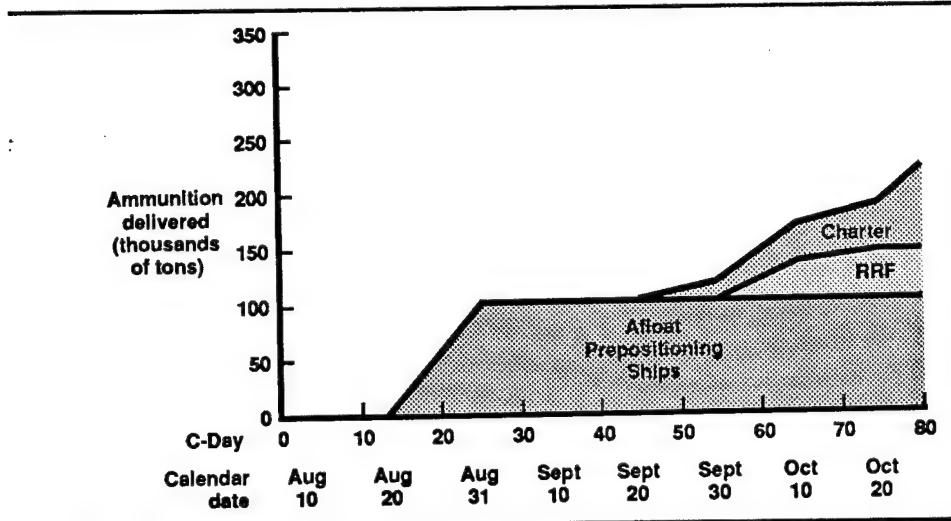


In spite of these problems, RRF ships delivered just over one-third of the cargo sent to Saudi Arabia in Phase I. In total, government-owned ships delivered nearly three-quarters of sealifted cargo. The eight Fast Sealift Ships (FSS) delivered close to 20 percent. Considering both the initial deliveries of prepositioned materiel and subsequent deliveries of new cargo picked up from CONUS, prepositioning ships (both MPS and APS) closed 20 percent of the cargo.

But, chartered ships, and notably chartered foreign flag ships, also contributed in important ways. Charters helped fill the gaps created by RRF problems.

Before ODS some planners questioned the wisdom of "relying" on foreign flag shipping to carry U.S. military equipment to combat zones. But ODS had broad international support and the 38 foreign ships chartered in Phase I delivered their cargo without incident.

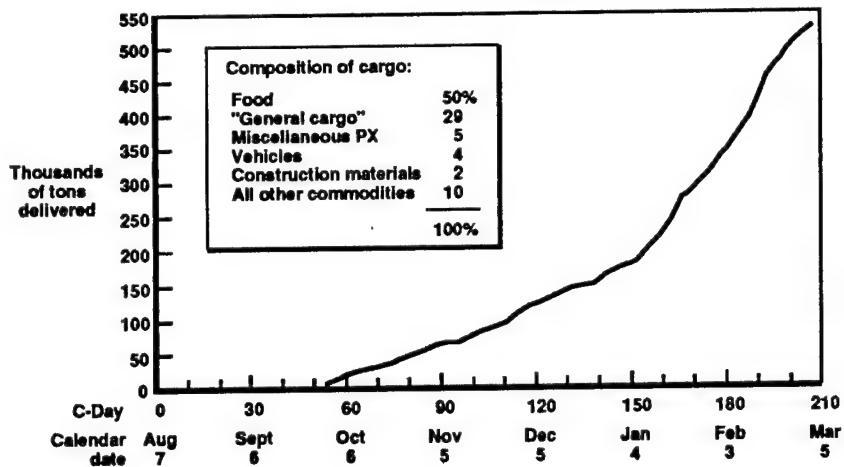
Afloat Prepositioning Delivered About Half the Munitions



Ammunition is one of the most important sustainment supplies. During Phase I the Afloat Prepositioning Ships provided the only early deliveries and about half the total ammunition shipped to the Mideast.

The ammunition shipping effort developed slowly. The first ship to carry ammunition from CONUS was chartered on August 11 but did not complete loading and sail until the end of August. Perhaps because priority was given to activating RRF roll-on/roll-off ships for unit equipment, the two RRF breakbulk ships used to carry ammunition were not ordered activated until August 20th. Activating and loading these ships took 30 days. Though loading times for ammunition cargos are significant longer—averaging 12 days—this factor does not fully explain the slow buildup of ammunition deliveries. Slow munitions deliveries could result in a serious constraint on combat operations in future contingencies.

Containerization of Cargo Was Used To Deliver Sustainment Supplies



The Special Mid-East Shipping Agreement (SMESA) was used to deliver most other sealifted sustainment supplies. The SMESA was negotiated between the Military Sealift Command (MSC) and U.S. commercial shipowners in August; it provided DoD with container slots for use in shipping to Saudi ports. The first deliveries under the SMESA reached the theater at the end of September.

Foodstuffs of one sort or another made up about half the cargo delivered by SMESA shipping.³² Available records suggest that about 30 percent of the containers were labeled only as "general cargo." Lack of more specific information about container contents caused problems for logisticians in the theater.

³²Calculated from records provided by the Military Traffic Management Command.

5. ANALYSIS OF PHASE II: DEPLOYING THE OFFENSIVE FORCE

Phase II deployments required sending the additional combat forces and the larger levels of support needed to make successful offensive operations possible. They began in mid-November and were essentially completed in early February. This section presents a brief overview of Phase II deployment operations.

Conditions Were Different for Phase II

- Deployment systems were up and running
 - deployment plans developed and evaluated for transportation feasibility
 - majority of U.S. government lift assets activated
 - over 50 commercial ships were under charter
- Larger forces had to be moved in less time
- Lateral deployment from Europe while deploying additional units from CONUS
- Arriving units had to move substantial distances in theater
- Air warfare began while force deployments continued

Phase II conditions were significantly different from Phase I. Planning for these deployments had been under way for some time and different options for the Phase II deployments had been developed and compared to transportation capabilities. Much of the U.S. lift had been activated and organizations and procedures for getting more had been tested. DoD had 50 ships under charter. Planners with access to the upcoming announcement were able to take actions to hold and position shipping for subsequent Phase II operations.

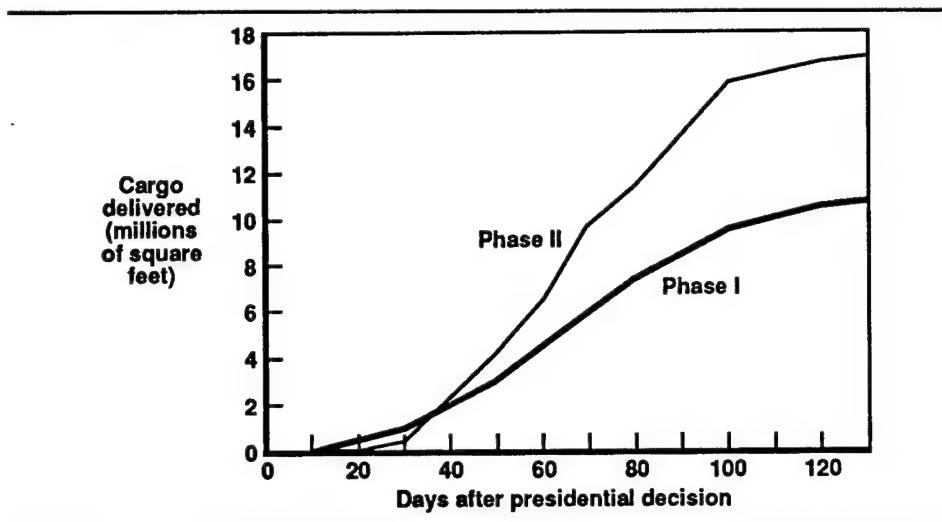
Nonetheless, Phase II required that more cargo be moved faster. Though fewer combat units were sent, requirements for combat support and combat service support units were far larger than in Phase I. Force modernization decisions added to shipping workload.

The fact that much of this cargo was to come from U.S. Army forces in Europe worked to reduce the amount of shipping needed, since distances were somewhat shorter.³⁷ Though USAREUR has been more accustomed to being on the receiving end of deployments, 31,000 VIIth Corps vehicles were shipped to ports by convoy, railroad, or barges.

Last, reception and onward movement were more complicated during Phase II. Deploying units had to be moved farther from the seaports and, in January, the air war began while deployments were still under way.

³⁷Sailing distance from Amsterdam to Ad Damman is about 2,000 nmi less (23 percent) than from Jacksonville, Florida.

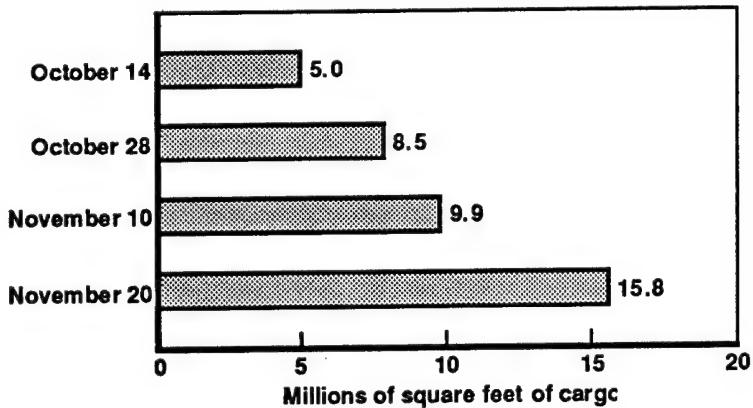
Phase II Shipping Went Faster and Further



This figure compares the deliveries of unit equipment cargo into the Gulf region measured as a function of time after the Presidential decision. The pace and volume of deliveries were notably faster in Phase II, reflecting both the readiness of the mobility community and the shorter distance from Europe. In the first 60 days, for example, deliveries were about 30 percent larger. In all, Phase II deliveries were 40 percent larger.

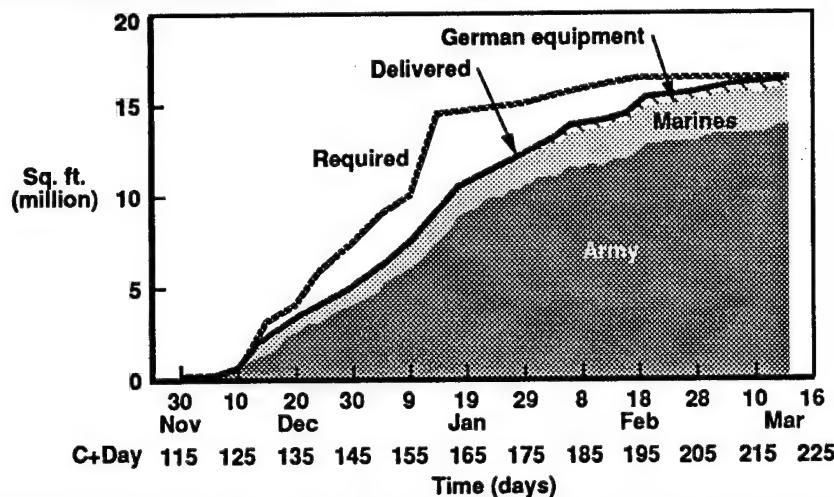
Our estimate is that the sum of both phases was 29 to 30 million square feet of cargo delivered: about 12 million (40 percent) in Phase I and 17 million (about 60 percent) in Phase II.

USTRANCOM's Estimates of Cargo Grew



All was not easy for Phase II transportation planners. TRANSCOM's estimates of the amount of Phase II cargo to be moved grew steadily. The amount of cargo thought to be needed doubled from the mid-October planning estimate to the time of the Phase II deployment announcement. And, it continued to grow. Within three weeks of the President's decision, the estimate of cargo to be shipped grew another 60 percent.

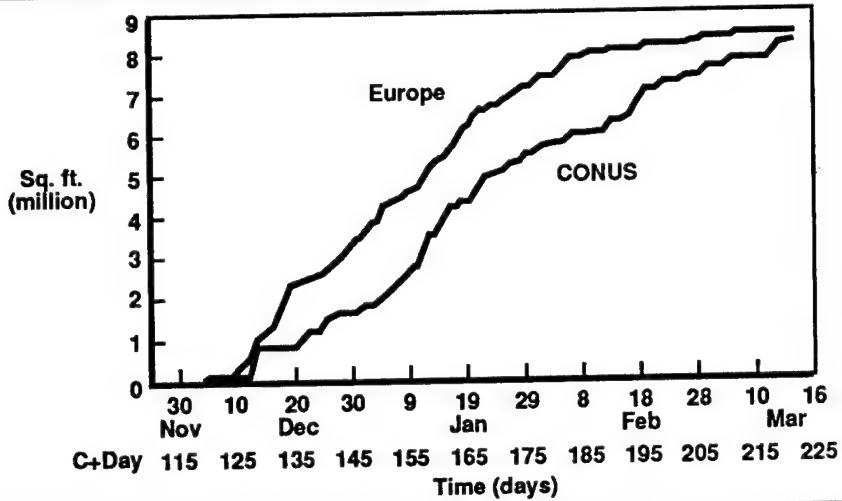
In Phase II, Sealift Deliveries Lagged Requirements



This chart compares actual Phase II sealift deliveries with total requirements for unit equipment as estimated by USTRANSCOM at the end of December. At the outset, deliveries of cargo led requirements for a short time. But deliveries soon began to lag. Throughout most of December the lag was about seven days. Since the goal was to close the forces by the U.N. deadline for Iraq to leave Kuwait, requirements rose steeply in January. Deliveries continued at a steady pace but lagged the requirements by up to a month. Apparently, the war was fought and won with less equipment in the theater than required, at least according to USTRANSCOM's estimate.

The great bulk of the unit cargo—about 80—percent that was delivered belonged to the U.S. Army. Marine Corps equipment delivered from CONUS constituted most of the rest. Shipments of equipment supplied by Germany and other coalition partners in Europe amounted to about 500,000 square feet, 3 percent of the total.

Sealift Deliveries from CONUS and Europe Were Roughly Equal



Though most of the Army combat forces sent to Saudi Arabia during Phase II came from Europe, unit equipment shipments from Europe were only a little larger than those from CONUS. Given the longer distances from CONUS, it is not surprising that equipment from CONUS reached the Gulf a week or two later than that shipped from Europe.

Though one division—the 1st Infantry Division (Mechanized)—was shipped from CONUS in Phase II, the largest share of CONUS unit cargo consisted of equipment for various combat support and combat service support units.

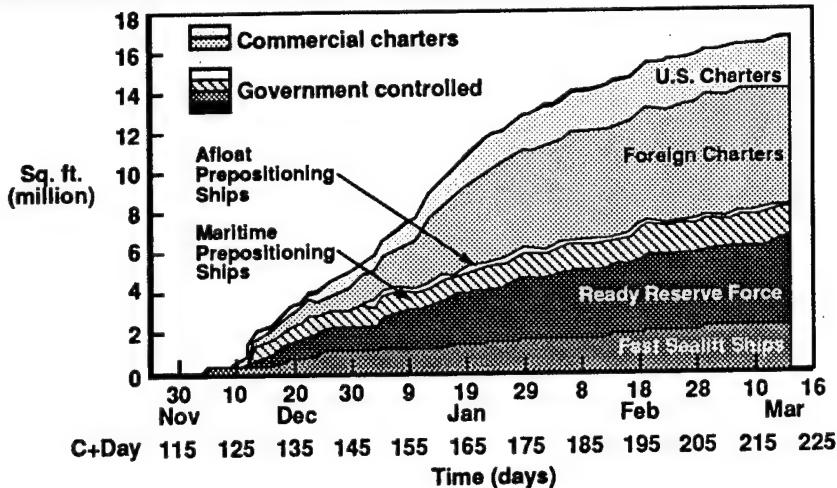
DoD Continued to Scramble for Shipping

- 27 more RRF dry cargo ships were activated
- 128 more ships were chartered
 - 12 U.S. flag
 - 116 foreign flag
- The chartering effort employed
 - Smaller ships
 - A high proportion of foreign flag ships

To meet the growing cargo requirement DoD had to scramble for shipping. Eventually another 27 of the RRF's breakbulk ships were activated.³⁸ But most of the increase in shipping was taken from the charter market and more than 90 percent of the new charters were foreign flag ships. By almost any measure the newly chartered ships were less desirable than the ships hired in Phase I. The proportion of Roll-on/Roll-offs ships was lower. The ships were smaller and the lead time for the charters was longer than in Phase I.

³⁸Three RRF dry cargo ships were ordered activated on November 9th and 10th. Then 14 more activations were requested on December 4th. The remaining ten RRF activations were ordered in ones or twos in December, January, and February.

Chartered Ships Carried the Major Part of the Cargo

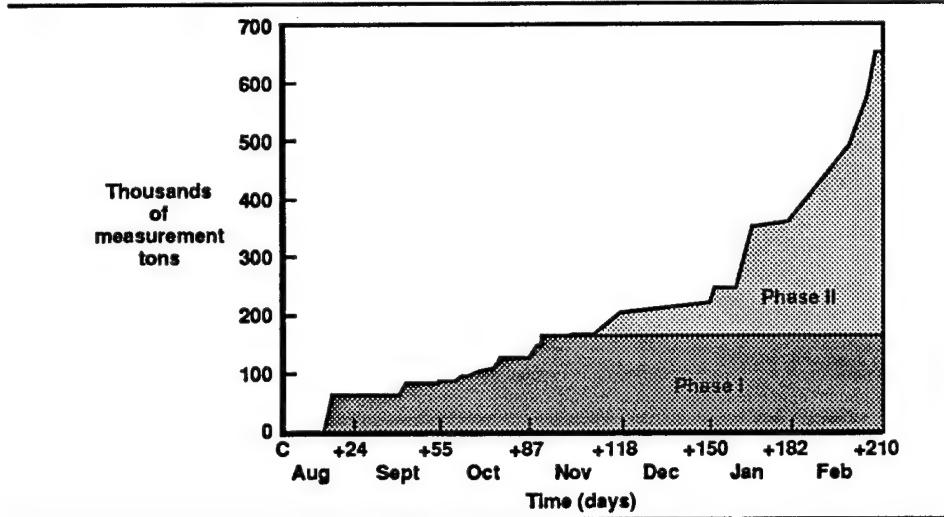


This figure shows the steady buildup of Phase II cargo deliveries to Saudi Arabia. In contrast to Phase I, the first Phase II deliveries were made by the FSS. Some FSS and other ships had been "parked" for a time to have them ready for the initial loads of Phase II cargo. This forehanded operation was handled outside routine ODS ship operations management channels. Phase II saw the employment of the third squadron of MPS ships (MPS 1, carrying the equipment of the 6th MEB). They reached the Gulf at about the time the first chartered ship from Europe arrived. MPS 1 had to travel from the East Coast of CONUS.

The figure makes clear that chartered ships delivered a little more than half the Phase II cargo, with foreign ships doing the lion's share of the work. Foreign flag ships continued to perform well though there were a few disruptions when the air campaign began.³⁹

³⁹At the outset of the air war and Scud attacks, four foreign flag ships (out of more than 150 under charter) refused to enter ports to deliver their cargos. For two the pause was just a few days; for a third it lasted two weeks. Cargo from the fourth ship had to be transferred to another vessel. Ironically, the refusing vessel flew the United Arab Emirates (UAE) flag.

Ammunition Deliveries Surged in January and February



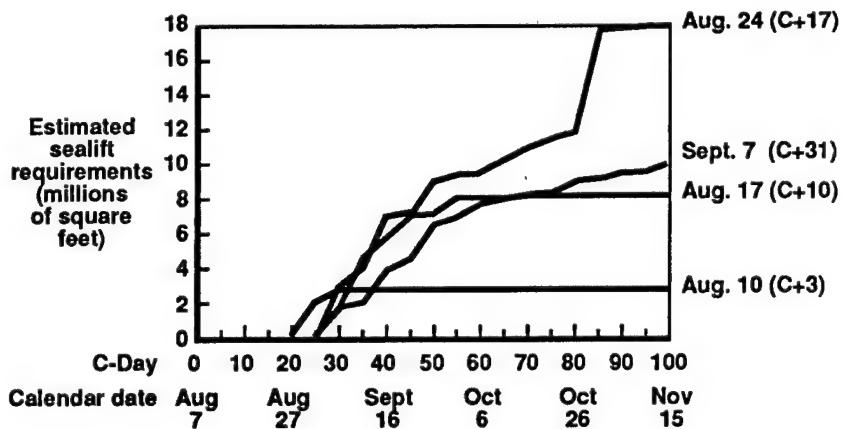
Ammunition ship deliveries to Saudi Arabia surged in January and February. This was the result of the final determination of munitions requirements reached by CENTCOM and the Services around the first of December.

But, in spite of the uncertainty, the requirement for some additional shipments should have been clear. Ultimately, additional RRF ships were activated and more ships were chartered to meet ammunition delivery requirements. Ammunitions ships took nine days to load on average, much longer than the two days average for roll-on/roll-off ships carrying unit equipment. Blocking, bracing, and sheathing munitions cargos added to loading times. Unloading ammunition ships in the theater also took much longer. Even though many munitions ships came from Northern Europe, the buildup in the theater did not pick up dramatically until mid to late January.

6. ILLUSTRATIONS OF DEPLOYMENT ISSUES

Analysis of ODS deployments need not be limited to describing and assessing aggregate deployment performance. This section presents some examples of analyses of specific issues that arose during the operations. There are two purposes. First, the issues are pertinent to planning and conducting future deployments. Second, the examples illustrate how operational data can be focused to show important details of deployment activities not evident in the aggregate analyses.

TRANSCOM's Estimates of Demands for Sealift Were Varying



Though mobility decisions were made promptly, implementation of the decision to deploy was hampered by changing estimates of total requirements.⁴⁶ In this, Phase I was like Phase II.

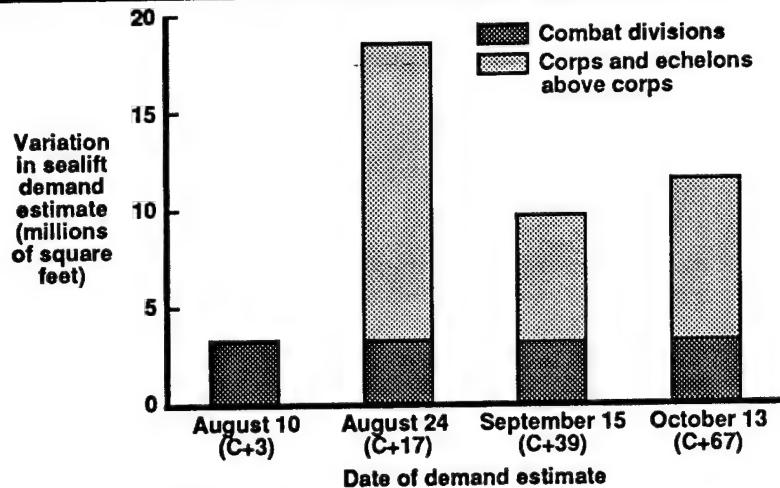
The chart shows TRANSCOM's estimates of total sealift requirements during the first month of ODS. The picture for airlift is similar. TRANSCOM's initial estimate was quite small; about 2.5 million square feet was needed and requirements leveled off in 30 days. A

⁴⁶This has been acknowledged by the U.S. Transportation Command. See the testimony of its Commander-in-Chief, General Johnson, House of Representatives, Subcommittee on the Department of Defense of the Committee on Appropriations, *Hearings on Department of Defense Appropriations for 1992*, 102nd Congress, First Session, p. 36. General Johnson said he would have asked for CRAF earlier and "requested ships sooner."

week later the estimate had tripled to about 8 million square feet with requirements leveling off in 60 days. By August 24, the estimate was up to 18 million square feet of shipping.

Requirements for all the Services were then given a serious scrub. The pattern of the September 7th estimate is only about 20 percent less than what was eventually achieved.

The Variation Was Driven by Army Noncombat Unit Requirements



It is difficult to attribute the variations in TRANSCOM's estimates of requirements directly to specific causes. Some may be due to changing requirements from CENTCOM. Some may be due to incomplete coordination or communication between the Services and TRANSCOM. But our work suggests that the process of building the TPFDD in the Army drove much of the variation.

The chart above shows estimates of total Army cargo requirements at four points in time. CENTCOM's requirements for Army combat units were clear at the outset and varied only in detail. Army estimates of requirements for combat support and combat service support—corps support and echelons above corps—varied considerably and in a pattern that roughly matches TRANSCOM's estimates.⁴⁷

⁴⁷By some accounts, the Army constructed its portion of the TPFDD by beginning with a TPFDD developed for another contingency, finding it easier to eliminate units not needed than to locate and add support units one at a time. This may explain the size of the August 24th estimate. But the record may have been transmitted before it had been completely scrubbed, thereby confusing others who drew data from the TPFDD for deployment planning and scheduling.

Initially There Were Airlift Coordination Problems

- **Users were not prepared to handle airlift at a rate of two missions per hour**
- **Some users complained of inadequate and mistaken notification**
- **MAC shifted to a rate of one mission per hour and reduced delays and congestion**
- **MAC used "Requirements Augmentees" to coordinate directly with users**

ODS airlift operations began quickly and grew rapidly. Analysis indicates that airlift performance suffered initially from problems of coordination between the deploying units (users) and the Military Aircraft Command (MAC).

In the very early stages of the deployments, MAC flowed cargo aircraft to places like Pope Air Force Base (AFB) (to load the 82nd Airborne Division) and Langley AFB (to load tactical air squadron cargos) at rates that approached two aircraft per hour. MAC data show that cargo was not available at that pace. Airlifters were held waiting for cargo; confusion and congestion resulted. Pushing the airlift system to move the most it possibly could actually reduced deliveries. At the same time, some users complained that they were hampered by incomplete and inaccurate notification about the airlift being supplied to them. After MAC slowed the rate of airlift to a level of one airlifter per hour or less, congestion was reduced and delays on the ground fell sharply.⁴⁸ And, during August, MAC set up a special staff, called "Requirements Augmentees" to coordinate directly (i.e., by phone) with deploying units.

⁴⁸This summary is based on an analyses of MAC data conducted by RAND's Project AIR FORCE Desert Shield Assessment Team. No attempt was made to pick up the pace again after the initial problems had been overcome. Thus, there is no evidence on whether practiced operators could achieve a higher pace.

In Phase II Unit Integrity Was Not Achieved

Example: Deployment of 51st Signal Battalion

- Deployed 346 "pieces" through two ports
 - 180 pieces via Antwerp
 - 166 pieces via Rotterdam
- Deployed on 19 ships
 - 10 at Antwerp
 - 9 at Rotterdam
- The ships arrived over a 26 day period
 - 5 December to
 - 31 December

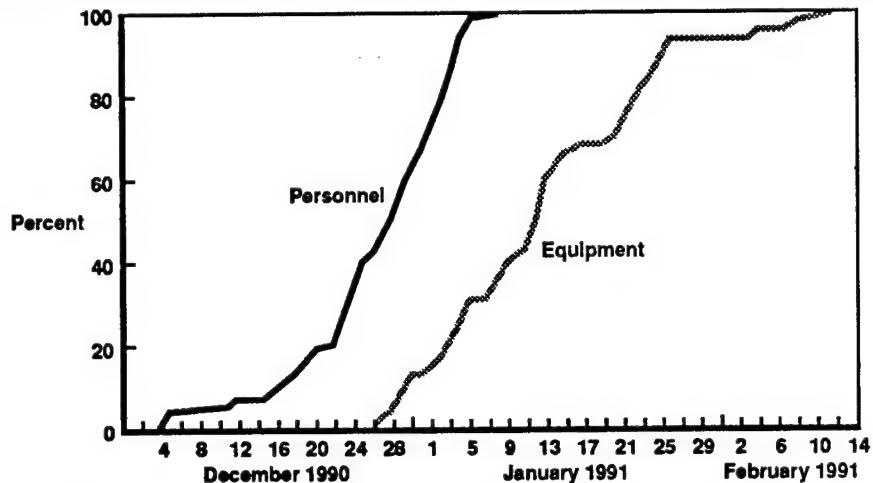
ODS was largely conducted as an "administrative" deployment. Unit integrity was sacrificed to maximize the use of limited shipping. Even so, reception and onward movement in Saudi Arabia were hampered by the need to collect equipment from many ships arriving over periods that sometimes lasted more than a month.

During Phase II, personnel from the 1st Infantry Division controlled the reception of 7th Corps units deploying from Germany. They examined a sample of 25 battalions arriving at Dammam. The average battalion's equipment was sent on ten ships.⁴⁹ The 51st Signal Battalion is not the worst case; one battalion went to war on 27 ships.⁵⁰

⁴⁹These data are reported in *VII Corps Debarkation and Onward Movement, Desert Shield/Storm After Action Report*, prepared by Colonel Steve Wesbrook for the 1st Infantry Division (Forward), 30 May 1991, pp. A-8-1 and A-8-9.

⁵⁰Data on the shipping of the 51st Signal Battalion were provided by Headquarters, Military Traffic Management Command, Europe.

Equipment and Personnel Coordination Was Overruled in Phase II

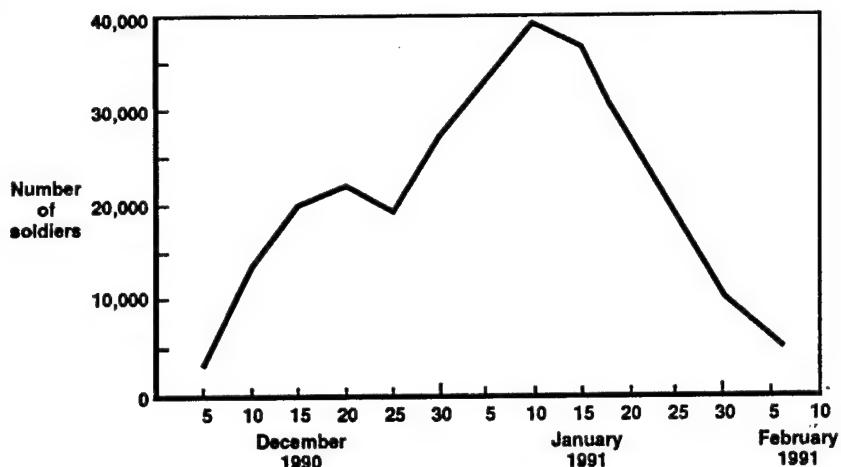


For much of the deployment, top-level commanders aimed at coordinating the arrival of personnel into the theater to match a five- to seven-day "window" around the arrival of their unit's equipment. The dispersion of units over many ships made that difficult to achieve.

In any case, that goal was clearly overruled in the Phase II deployments of personnel from Europe. This figure shows the delivery of equipment and personnel from the 3rd Armored Division.⁵¹ The flow of personnel led the arrival of equipment by one to three weeks. Apparently the goal was to get the personnel into the theater before the January 15th U.N. deadline even if their equipment was still en route.

⁵¹The pattern is typical of the units deploying from Europe. See Westbrook, op. cit., pp. A-10-1 and A-10-2.

The Result Was a Buildup of Soldiers in Temporary Camps



As a consequence of the decision to flow personnel independent of the delivery of their equipment, soldiers had to be billeted in makeshift temporary housing. Providing this housing, feeding, and otherwise caring for these soldiers created an additional workload for the support establishment that had been created in Saudi Arabia. Moreover, the soldiers, crowded into temporary quarters without their combat equipment, were more a vulnerable target than an effective combat force. Though Iraq did not exploit this vulnerability, future opponents may be more aggressive. Future planning must consider this possibility.

Logistics Support Problems Led to the Creation of "Desert Express"

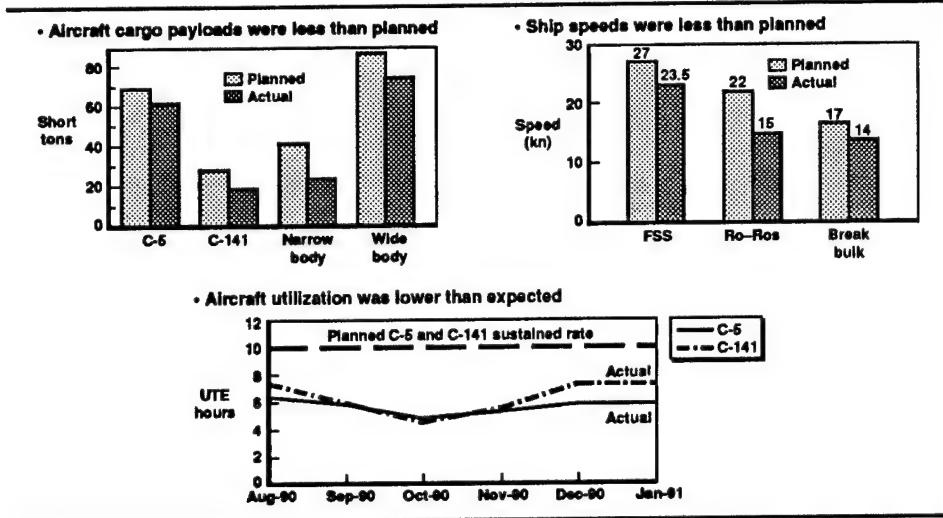
- High-priority air resupply cargo exceeded available airlift; as a result, backlog grew
- Managers could not identify and expedite the highest-priority shipments
- DoD created an express delivery system to provide responsive resupply - "Desert Express"
 - Dedicated airlift
 - A rigorous priority system

As ODS proceeded, cargo moving into air resupply channels came to exceed the airlift capacity allocated for that activity. There were the usual complaints of "inflation" of priorities and attempts to impose "discipline." But cargo backlogs grew and delivery times for even the most urgent items increased. Moreover, airlift channel operators were not able to identify and expedite the shipment of the highest priority packages in spite of the best efforts of CENTCOM's rear organization.

At the end of October TRANSCOM created an express delivery service, called "Desert Express" to provide responsive resupply service for so-called "show stoppers." The basic idea was to link commercial small package services (and organic DoD airlift) with a dedicated, scheduled MAC C-141 service between Charleston, South Carolina, and Saudi Arabia. Within Saudi Arabia, theater aircraft moved some of the cargo forward. The volume of cargo that could be shipped into this channel was limited by a strictly enforced capacity allocation. Though Desert Express operations were later expanded, they delivered less than 1 percent of airlifted cargo.⁵²

⁵²Similar express or "redball" services have been set up in every sustained U.S. deployment since World War II. Yet they have never become part of the transportation force structure.

Many Planning Factors Were Not Achieved



ODS provides data on most aspects of mobility systems operations. These can be compared with pre-ODS planning factors used in estimating airlift capabilities. Here are three examples of such comparisons. The Army's Concepts Analysis Agency has done comprehensive and informative work of this sort.⁵³

RAND's Project AIR FORCE has also made a number of such comparisons. Two are presented here. Across the board, aircraft payloads were less than planned, as much as 25 percent in the case of the C-141. The planning factor for sustained utilization of the C-141 and the C-5 has been ten hours per day. In ODS, neither airlifter achieved an average of eight hours utilization.

The results for ship speed—taken from the CAA work—are similar. Speeds were notably slower than published planning factors.⁵⁴ And, as mentioned above, planning often omits considerations of ship reliability and maintenance cycles.

⁵³See Vance, op. cit.

⁵⁴Other CAA comparisons of planning factors and ODS experience included the size of cargo loads, the numbers of lift vehicles, sea and airport availability, ship load capacities, shiploading times, and more. The results are presented in Vance, op. cit.

7. OBSERVATIONS ON DEPLOYMENT PLANNING AND EXECUTION

Analyses of ODS data are not an end in themselves. The goal of the analyses summarized in this presentation is to improve future deployment operations. Some of the observations noted provide clear and relevant "lessons" for improving future large-scale deployments. But all observations based on the unique ODS deployment experience need to be tested for their relevance in likely future contingencies.

Observations about CONUS deployment operations and command and control are most likely to be directly applicable in future major regional contingencies. Observations about strategic airlift and sealift performance may also be relevant for planning and funding future deployment capabilities. But they need to be tested explicitly in the context of future contingencies, which may not display any of the unique conditions experienced in ODS. Observations about requirements for reception of forces in future theaters and moving them onward are the least likely to be directly relevant for planning. Requirements for such capabilities depend importantly on host nation facilities and support, climate, geography, expected enemy countermeasures, and other factors that may well differ greatly in future major regional contingencies.

A Global View of ODS Mobility Experience

- Successful deployments were the legacy of earlier organization and planning
- Prepositioning programs paid off
- Airlift performance was less than projected
- Sealift was on the critical path for ground force equipment
- Many issues surfaced during ODS
 - Planning uncertainties
 - Unrealistic planning factors
 - Air-sea coordination
 - JOPES management
 - Changing priorities
 - RRF readiness
 - Unit integrity
 - UMMIPS failures

The ODS deployment operations were clearly successful. Much of the success must be attributed to decisions made five to twelve years ago: the creation of the Joint Deployment

Agency, the RDJTF, and TRANSCOM; the procurement of significant increases in strategic airlift and sealift; the establishment of the afloat and maritime prepositioning programs; and the training and exercising of mobility system personnel at every level.

The prepositioning programs clearly paid off.

Airlift delivered some 500,000 passengers without serious problems but cargo deliveries did not achieve the levels implied by planning factors.

Delivery of ground force combat and support unit equipment was the bulk of the shipping job. Strategic sealift capabilities were on the critical path, limiting the rate of closure of U.S. combat forces.

The SMESA and Desert Express were productive innovations.

But many significant issues emerge from the ODS deployment experience.

ODS Identifies Important Issues for Deployment Planning and Investment

- How to provide more responsive deployment planning
- How to improve coordination of deployment operation
- Are improvements needed in CONUS
- Whether to add to prepositioning
- How to provide the needed airlift capabilities
- How to improve sealift capabilities
- What theater reception capabilities should DoD provide?

The many issues raised by the ODS deployment experience can be considered in seven broad categories. The answers to these policy questions should be reached through detailed and objective analyses of capabilities and costs. Moreover, those analyses must survive thorough review and public debate. Defining the issues correctly is a vital first step.

Defining the issues requires an explicit vision of the future. My view is that the basic mode of deployment will persist. U.S. deployments will continue to rely on sealift to move the bulk of DoD equipment and airlift to carry DoD personnel to theaters where they will “marry up” with their equipment and then move forward under joint command. But future contingencies may differ significantly from ODS conditions. Secretary Cheney put the general point this way, “having been through several of these [contingencies] now . . . each one’s different.”⁵⁵ One important difference to consider is the need to make faster deployments through ports and airfields that come under attack. Given this vision and set of issues, the next section speculates about the directions the answers will take.

⁵⁵This quotation is taken from the Reuter transcript report of Secretary Cheney’s address to the Inland Press Association, October 22, 1991. The Secretary was reflecting on his experience in the Ford Administration as well as the events he has participated in as Secretary of Defense.

8. SPECULATION ABOUT FUTURE DEPLOYMENT SYSTEMS

The outlines of the answers to many of the questions posed in the preceding section are not hard to perceive. This section provides suggestions about the directions the answers will take after the needed analyses have been completed and debated. For the most part they reflect common sense reactions to the ODS deployment experience.

Planning for deployments must take an end-to-end, total system perspective. Though sealift constrained ODS deployments, buying more sealift will not necessarily result in faster deployments; other constraints may come into effect. Planning must also reflect the reality of defense budget constraints. All end-to-end improvements will not be funded simultaneously.

In ODS, uncertainty about requirements delayed the mobilization of appropriate resources. To avoid this problem DoD needs a trusted tool for providing a rapid (less than two hours) and authoritative "top-down" estimate of total deployment requirements.

Building such a model is a small matter. Testing it sufficiently so that it is trusted throughout DoD is essential. Planning and training need to be directed away from time-consuming "deliberate planning" processes into realistic "crisis action" training exercises. All planning should use planning factors based on experience, ODS experience where it is relevant, and field exercise data where ODS experience does not apply. Improvements of this sort will cost little in DoD budgets.

ODS pressures motivated DoD personnel to overcome limitations imposed by inadequate, incomplete, and outmoded mobility command and control systems. But coordination and information problems hampered airlift, theater reception, and some other operations. Modernization of the Joint Operation Planning and Execution System (JOPES) can help prevent such problems in future contingencies. It should aim at: (1) making that system more "user friendly," (2) providing the responsible theater commander with full control over the system records, and (3) ensuring that all potential users—both deploying units and their transporters—have the equipment and personnel trained and practiced in using JOPES and other appropriate command and control systems.

In ODS force movement in CONUS generally went well. But faster-paced future deployments may require enlarged and modernized facilities at CONUS installations and seaports. In particular, investments in container-handling facilities for both unit equipment and ammunition appear necessary. Total spending could amount to a few hundred million dollars.

Prepositioning programs worked well in ODS and have been reconstituted. The issue is whether to preposition more materiel than in the past. The changes in the security planning environment imply a shift away from land-based prepositioning, in spite of its lower costs. The vision of faster deployments in the face of capable opposition suggests a requirement for early closure of significant, well supported combat power. Only prepositioning can satisfy that vision.⁵⁸ Prepositioning two million square feet of Army combat and support unit equipment would require as many as ten new ships costing \$2.5 to \$3.0 billion to procure.⁵⁹

In ODS, airlift met passenger delivery requirements but fell short of expectations for cargo capacity. Faster deployments—like those associated with improved sealift—will place greater demands on airlift. Some C-17 procurement may be needed. Ensuring access to adequate enroute airfields and refueling is essential. Both equipment and personnel programs can be adapted to provide greater airlift capability. Appropriate material programs include deployable cargo handling, fueling, and other ground support equipment and higher levels of spare parts and maintenance equipment for airlifters. DoD should also provide and manage sufficient trained crews to sustain intense airlift operations and have prompt access to all ground and aircrew personnel needed for early operations. Coordination between airlift and users—both those in CONUS and those in the theater—also needs attention. Finally, DoD should act aggressively to enlarge and improve the Civil Reserve Air Fleet (CRAF). CRAF provides essential passenger lift as well as “surge” cargo airlift capacity. The cost of CRAF, crew, and infrastructure programs cannot be assessed until detailed studies are completed.

Sealift constrained vital ODS ground force deployments. Planning should focus on balancing the “tiers” of ship readiness needed with projected cargo availability. Procuring roll-on/roll-off ships and keeping them at high readiness (the second tier, after maritime prepositioning) would ensure immediate access to needed ships. A program of 30 such ships would provide a robust sealift capability at a procurement cost of \$4.5 to \$7.0 billion depending on the mix of new and used ships. Ensuring prompt access to the Ready Reserve Force, the RRF (the third tier), will require \$100 to \$200 million a year more in operations and maintenance funds. Foreign flag ships were used extensively in ODS; their overall

⁵⁸Increased prepositioning implies greater need for airlift of personnel and some accompanying equipment at the earliest stages of contingencies. That is the period when competition for airlift is greatest.

⁵⁹There would, of course, be additional costs for the Army equipment stored aboard the ships, as well as for ship operations.

performance must be judged satisfactory. Though foreign ships may not be available promptly in future contingencies, the roll-on/roll-off and RRF programs will fill early needs. Faster movements also demand that ship loading units be available on short notice.

Future theater deployment support needs are harder to predict. To meet the needs of rapidly developing contingencies, part of the needed materiel handling, transportation, engineering, medical, and other support equipment could be prepositioned at sea. The personnel needed to speed these operations need to be available quickly and should be familiar with the facilities and conditions in their assigned theaters. Here, too, detailed studies are needed to define specific programs and their costs.